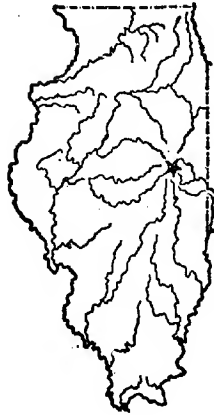


UNIVERSITY OF ILLINOIS
Agricultural Experiment Station

BULLETIN No. 198

SOYBEANS AND COWPEAS IN ILLINOIS

By W. L. BURLISON AND O. M. ALLYN



URBANA, ILLINOIS, APRIL, 1917

SUMMARY OF BULLETIN No. 198

SOYBEANS

GENERAL SUGGESTIONS.—The soybean is an annual legume crop, and usually requires inoculation. Fundamental principles observed for the growing of alfalfa or corn are applicable for the growing of soybeans. Pages 3-6

Thirty to forty pounds of seed per acre will be sufficient when the beans are planted in rows. If sown broadcast, one bushel to six pecks will be required. Page 4

Early soybeans should be used in a rotation where wheat follows, even though the yields of these varieties are lower than the yields of later varieties. Pages 6, 12, 15

CENTRAL ILLINOIS.—Haberlandt, Hong Kong, Chestnut, Amherst, Ebony, Sherwood, Meyer, and Nuttall are leading varieties in central Illinois, for seed production. Ebony is a standard, consistent-yielding, medium-late variety. Medium Yellow, although not a high-yielding variety in seed, is an early type, and for this reason it is usually planted when winter wheat is to follow soybeans. Pages 6-11

SOUTHERN ILLINOIS.—For southern Illinois Medium Yellow is considered the best early variety of soybeans. Ebony is a desirable late variety. It produces good yields of seed and hay; the beans possess high quality; and the plants retain their leaves well. Pages 12-15

CHARACTERISTICS OF VARIETIES OF SOYBEANS. Pages 16-18

COWPEAS

Cowpeas are rather unsatisfactory for central Illinois as compared with soybeans. They are also distinctly less desirable for southern Illinois, except on poor, unfertilized, sour soil, where they may be more hardy and therefore the better crop to raise. Pages 15, 19-20

SOYBEANS AND COWPEAS IN ILLINOIS

BY W. L. BURLISON, ASSOCIATE CHIEF IN CROP PRODUCTION, AND
O. M. ALLYN, FIRST ASSISTANT IN CROP PRODUCTION

SOYBEANS

The soybean has rapidly gained popularity in Illinois during the last ten years because it fits so well into systems of farming when clover fails, and because it thrives in this climate under soil conditions which either exist or which the farmer can provide.

Soybeans may serve a variety of purposes, but up to the present time the crop has been cultivated primarily for seed production. On a more or less limited scale it will be found profitable for soiling cattle and sheep. As a hay crop it is satisfactory for most classes of live stock. When pastured by hogs and cattle, it gives profitable returns. When clover fails, soybeans may well be grown as a green manure for soil improvement.

For years the soybean has been cultivated in Japan and China, mainly for human food and for oil. It was first cultivated in the United States in 1829, but was little known until 1854. Since then the crop has spread to many parts of the United States.

SOIL AND CLIMATIC REQUIREMENTS

Soybeans are not very particular in their soil requirements, but they grow best on well-drained soils containing plenty of limestone. For the successful production of soybeans, inoculation is usually necessary.

The climatic requirements for soybeans are about the same as for corn. Altho they are not particularly sensitive to an abundance of moisture, they will not thrive where water stands for any extended length of time. They are hardy and will resist drouth and considerable cold weather, even when young, and they are still more resistant when they have advanced toward maturity. It is claimed that in the fall the leaves of some varieties will not be killed when the temperature falls as low as 27 degrees Fahrenheit. "If the pods are fairly well filled before a killing frost occurs, they will usually ripen satisfactorily."¹

¹Piper: *Forage and Fiber Crops* (Macmillan).

PLANT CHARACTERISTICS

The soybean is a legume plant, and has many points in common with clover, alfalfa, cowpeas, and field peas. It is an annual; that is, it must be planted each year. It possesses a strong main stem from one to three feet tall and more or less branched. The seed pods are pea-like and profusely distributed along the main stem. Most of the varieties have many leaves. Some types shatter badly; which, of course, is undesirable. The soybean varies greatly in many of its qualities, and it is advisable to select varieties with the following characteristics: high yield; upright habits of growth; plants not so coarse that the hay would be undesirable; ability to hold leaves; little or no tendency to shatter; and resistance to disease.

CULTURE

Altho soybeans will grow on the poorer soils, they respond to good soil conditions. The same fundamental principles observed for the growing of alfalfa or corn are applicable to this crop, including the preparation of a good seed bed.

It is a very common practice in central Illinois not to seed soybeans until the last of May, but there is no danger if seeding is done as early as May 10, or as early as it is customary to plant corn. Early maturing varieties may be seeded as late as June 15, or even a little later. A number of instances have been reported where soybeans have been planted as late as June 20 and good results obtained.

Thirty to forty pounds of seed per acre will be found sufficient when the beans are planted in rows, provided the seed germinates well. If sown broadcast, a bushel to six pecks will be found advisable with the medium-sized bean. For some time the Illinois Experiment Station has been conducting investigations with reference to the most desirable distance at which to plant the rows of seed. Table 1 gives in brief form the results of this study.

The meager data thus far secured indicate that, all things considered, the seed should be sown in rows about 28 inches apart, in narrow drills 6 to 8 inches apart, or broadcast. When the plants are to

TABLE 1.—YIELDS OF SOYBEANS WHEN PLANTED AT DIFFERENT DISTANCES
(Bushels per acre)

Distance between rows	1911	1912	1913	1914	1915
Broadcast	10.1	...	...	...	26.5
7 inches	8.6	...	...	...	25.4
14 inches	8.2	21.0	16.1	23.4	26.5
21 inches .....	...	17.8	21.1	25.1	25.9
28 inches	11.4	17.9	18.2	25.4	25.4
35 inches .....	...	16.5	18.5	25.6	23.8
42 inches .....	...	...	...	...	19.9

be used for hay, sowing broadcast or in narrow drills might be preferable under good conditions, but where much cultivation is likely to be necessary to destroy weeds, planting in rows is usually the best practice.

The common wheat drill is satisfactory for planting soybeans. In the investigations carried on at Urbana, the 7-inch drill has given good results. It is possible to stop a part of the holes so that rows may be planted at any of the distances mentioned in Table 1.

Methods of cultivating this crop are the same as those regularly used for corn. The weeder is a desirable implement, and may be used for a time even when the beans are seeded broadcast or in narrow drills. Soybeans are fairly good weed fighters, but they should be helped as much as possible in their struggle.

INOCULATION

It is usually advisable to inoculate soybeans. The surest way to accomplish this is by means of well-infected, natural soil, collected where soybeans have grown with an abundance of root nodules. Soybeans are not cross-inoculated by bacteria from other legumes.

The glue method of inoculation, first suggested by this station, has been found very satisfactory. Prepare a solution by heating one gallon of water and six ounces of glue. Moisten the soybeans with the mixture and sift over them well-pulverized, infected soil. Apply sufficient dirt to give a thin coating for each seed. Stir until the seeds are practically dry, and plant within a day or two.

Inoculation may be accomplished by drilling 100 pounds of soil per acre with the seed, or by broadcasting 500 to 1,000 pounds of infected soil after the ground is plowed and before the seed bed is prepared. For general practice, the Illinois Station does not recommend commercial cultures for inoculation of soybeans or other legumes.

HOW SOYBEANS ARE HARVESTED

When grown for hay, soybeans may be harvested successfully with the mowing machine, binder, or a regular pea harvester. When the beans are cut with the mowing machine, it is best to follow immediately with the fork and throw the cut plants over so that when the mower comes around the field again it will not ride over and mash down the swath previously cut. If the beans are of an upright variety and are not blown down, the crop can be harvested with the binder. If the plants have lodged badly, it may be necessary to put lifters on the cutter bar.

Cutting with a pea harvester is not practiced to any great extent, since the machine is a considerable item of cost and cannot be used for any other purpose. One objection to its use is that it cuts the plants below the surface of the ground.

WHEN TO CUT SOYBEANS

Soybeans should be cut for hay as soon as the pods are well formed. At this stage of growth the plants have not begun to lose their leaves. Later than this period many of the leaves fall and the plants grow woody. The same rules which govern the making of timothy or alfalfa hay apply for soybean hay.

In cutting soybeans for seed, the safest recommendation is to cut just before there is any danger of shattering. Some varieties shatter badly and should be watched carefully for this reason. The crop may be threshed with an ordinary threshing machine with the concaves set low and half the teeth removed. The speed of the cylinder must be reduced to about six or seven hundred revolutions a minute, to avoid splitting the beans.

VARIETY TRIALS FOR CENTRAL ILLINOIS
TESTS AT URBANA, IN CHAMPAIGN COUNTY

Soybean variety tests at Urbana were systematically started on the University South Farm in 1903. The seeding has been done with an ordinary grain drill, the seed openings being closed so as to place the drill rows 24 to 32 inches apart. As a rule, the drill gage is set for four or five pecks per acre, depending upon the size of the bean. During the early stages of its growth the crop is cultivated with the weeder, and later with the common cultivator. No special methods of cultivation have been followed in these variety trials.

The data reported have been obtained for the most part from two rotations, as follows: (1) corn, corn, corn, and soybeans; (2) corn, corn, spring grains, and clover. The soybeans were grown in the second rotation only when clover failed. In each of these rotations, a live-stock system and a grain system of farming are represented. The results reported in Tables 2 and 3 are the averages of the yields from both of these systems from 1903 to 1913, and from the grain system only, for the years 1914, 1915, and 1916.

Haberlandt, Hong Kong, Chestnut, Amherst, Ebony, Sherwood, Meyer, and Nuttall are leading varieties in central Illinois, for seed production. Ebony is a standard, consistent-yielding, medium-late variety. Medium Yellow, altho not a high-yielding variety in seed, is an early type, and for this reason it is usually planted when winter wheat is to follow soybeans.

Some of the regular trials at Urbana were planned for the purpose of obtaining information with reference to the hay yields of the soybeans in the live-stock system of farming. The yields are reported in Tables 4 and 5, but final conclusions should not be drawn from the figures since they cover only a few years.

TABLE 2.—AVERAGE YIELDS OF SEED FROM VARIETIES OF SOYBEANS GROWN AT URBANA
(Bushels per acre)

Variety	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	Per- centage rating
Medium Green.....	13.2	24.9	9.7	11.3	14.1	14.9	16.7	21.8	22.2	12.3	15.4	16.7	19.4	8.1	100.0
Ebony.....	16.0	12.9	15.3	22.9	23.7	25.1	14.3	14.8	19.4	20.8	10.6	113.7
Ito San.....	8.1	20.3	15.0	16.2	15.8	9.6	15.3	16.8	12.5	13.6	...	...	...	...	88.9
Ogema.....	...	9.3	...	7.3	4.0	6.4	4.1	13.6	2.9	3.9	...	...	...	...	37.3
Haberlandt.....	13.7	33.1	33.2	15.2	16.1	26.2	20.2	14.1	131.1
Black.....	13.1	14.2	...	11.2	6.7	7.9	7.0	...	6.1	...	...	...	...	...	56.4
Amherst.....	13.0	11.5	18.5	20.7	27.0	24.8	15.5	...	...	...	...	117.3
Chestnut.....	32.2	19.3	15.2	13.5	20.9	28.5	16.2	125.8
Swan.....	19.1	23.8	13.1	13.3	18.0	12.7	10.2	100.3
Meyer.....	24.2	28.7	12.3	16.5	21.7	16.9	11.7	113.9
Hong Kong.....	26.7	27.6	15.6	16.3	25.5	24.7	17.8	133.0
Wilson.....	20.7	23.4	12.0	17.2	19.3	18.4	12.9	111.2
Tasing.....	24.4	13.4	...	10.4	16.1	20.5	11.3	92.8
Nuttall.....	25.1	28.2	...	16.5	18.9	16.8	12.1	113.5
Sherwood.....	25.0	28.2	...	15.6	21.5	16.8	10.6	113.6
Medium Yellow.....	12.4	17.0	4.8	...	...	...	...	...	...	5.8	...	...	23.5	16.1	90.9
Flat King.....	21.2	18.4	8.2	14.6	...	...	...	87.0
Holly Brook.....	11.6	22.4	...	12.9	16.3	...	...	83.0
Early Yellow.....	7.8	16.0	16.3	...	...	...	...	...	...	...	...	...	...	...	83.9
A. K.....	20.0	27.8	16.1	144.6
Early Yellow Dwarf.....	...	14.0	7.0	...	...	...	...	...	...	...	...	...	...	...	60.7
Early Black.....	17.9	...	2.4	...	...	...	...	59.5
Habaro.....	27.2	11.9	...	...	...	...	...	88.9
Merko.....	19.6	24.0	...	...	...	...	...	99.1
Pingsu.....	24.3	30.0	...	...	...	...	...	123.4
U. S. D. A. No. 16780.....	21.5	24.3	...	...	...	...	...	104.1
Jet.....	24.8	22.9	...	...	...	...	...	108.4
Early White.....	61.4
Ito San Northern.....	10.1	13.3	...	...	...	...	...	...	...	...	...	...	...	...	...
Early Yellow Northern.....	12.5	...	...	...	...	...	...	...	...	...	...	...	...
Medium Green Northern.....	25.6	...	...	...	...	...	...	...	...	...	...	...	...
Brownie.....	6.8	...	...	...	...	...	...	...	...	...	...	...	...
Acme.....	8.0	...	...	2.7	...	...	...	...	...	...	...	...
Yellow.....	11.6	...	...	...	...	...	...

TABLE 3.—COMPARABLE AVERAGE YIELDS OF SEED FROM VARIETIES OF SOYBEANS
GROWN AT URBANA USING MEDIUM GREEN AS A STANDARD
(Bushels per acre)

Variety	Total number of tests	Number of years compared	Years on which comparison is based	Average yield
Medium Green.....	19	11	1906-1916	15.7
Ebony.....	45	11	" "	17.8
Medium Green.....	25	10	1903-1912	16.1
Ito San.....	14	10	" "	14.3
Medium Green.....	21	9	1904-1912	15.3
Ogema.....	10	9	" "	5.7
Medium Green.....	10	8	1909-1916	16.6
Haberlandt.....	10	8	" "	21.7
Medium Green.....	17	7	1903, 1904, 1906-1909, 1911	16.7
Black.....	11	7	" " " " " "	9.5
Medium Green.....	14	7	1906-1912	16.2
Amherst.....	9	7	" "	18.7
Medium Green.....	9	7	1910-1916	16.6
Chestnut.....	9	7	" "	20.8
Swan.....	9	7	" "	16.6
Meyer.....	9	7	" "	18.9
Hong Kong.....	9	7	" "	22.0
Wilson.....	9	7	" "	18.4
Medium Green.....	7	6	1910, 1911, 1913-1916	17.3
Tasbing.....	7	6	" " " "	16.0
Nuttall.....	7	6	" " " "	19.6
Sherwood.....	7	6	" " " "	19.6
Medium Green.....	15	6	1903-1905, 1912, 1915, 1916	14.6
Medium Yellow.....	10	6	" " " " " "	13.3
Medium Green.....	5	4	1910-1913	17.9
Flat King.....	5	4	" "	15.6
Medium Green.....	4	4	1910, 1911, 1913, 1914	19.0
Hollybrook.....	4	4	" " " "	15.8
Medium Green.....	11	3	1903-1905	15.9
Early Yellow.....	5	3	" "	13.4
Medium Green.....	4	3	1914-1916	14.7
A. K.	4	3	" "	21.3
Medium Green.....	6	2	1904, 1905	17.3
Early Yellow Dwarf.....	2	2	" "	10.5
Medium Green.....	3	2	1910, 1912	17.0
Early Black.....	2	2	" "	10.1
Medium Green.....	2	2	1910, 1911	22.0
Habaro.....	2	2	" "	19.5
Merko.....	2	2	" "	21.8
Pingsu.....	2	2	" "	27.1
U. S. D. A. No. 16786..	2	2	" "	22.9
Jet.....	2	2	" "	23.8
Medium Green.....	5	2	1903, 1904	19.0
Early White.....	3	2	" "	11.7

TABLE 4.—AVERAGE YIELDS OF HAY FROM VARIETIES OF SOYBEANS AT URBANA
(Tons per acre)

Variety	1904	1905	1914	1915	1916	Percentage rating
Medium Green.....	1.41	1.23	1.87	1.93	1.72	100.0
Medium Yellow.....	1.04	.70	...	1.80	1.27	133.7
Hong Kong.....	...	...	2.12	2.65	1.75	118.1
Chestnut.....	...	...	1.59	2.03	1.42	91.3
Sherwood.....	...	...	1.49	2.13	1.27	88.6
Nuttall.....	...	...	1.35	1.65	1.27	77.4
Wilson.....	...	...	1.39	1.92	1.75	91.7
Meyer.....	...	...	2.27	2.80	1.65	121.7
Haberlandt.....	...	...	1.85	2.38	1.27	99.6
A. K. ....	...	...	2.06	2.19	1.57	105.4
Swan.....	...	...	1.92	2.41	1.90	112.9
Tashing.....	...	...	1.62	1.73	1.32	84.6
Ebony.....	...	...	1.70	1.63	1.59	89.1
Black.....	1.63	.67	...	...	...	86.8
Early Yellow.....	1.69	.67	...	...	...	89.1
Ito San.....	1.51	1.35	...	...	...	107.9
Early Yellow Dwarf.....	.77	.72	...	...	...	56.2
Ogema.....	.75	.42	...	...	...	44.1
Late Yellow.....	2.08	...	...	...	...	147.5
Early White.....	1.93	...	...	...	...	136.9
Ito San Northern.....	...	1.05	...	...	...	85.4
Black Northern.....	...	.60	...	...	...	48.8
Early Yellow Northern.....	...	1.37	...	...	...	111.4
Late Yellow Northern.....	...	1.35	...	...	...	109.8
Ogema Northern.....	...	.45	...	...	...	36.6
Medium Green Northern.....	...	1.34	...	...	...	108.9
Hollybrook.....	...	...	1.77	...	...	94.7

TABLE 5.—COMPARABLE AVERAGE YIELDS OF HAY FROM VARIETIES OF SOYBEANS
GROWN AT URBANA USING MEDIUM GREEN AS A STANDARD
(Tons per acre)

Variety	Total No. of tests	No. of yrs. compared	Years on which comparison is based	Average yield
Medium Green.....	9	4	1904, 1905, 1915, 1916	1.57
Medium Yellow.....	6	4	" " " "	2.10
Medium Green.....	4	3	1914-1916	1.84
Hong Kong.....	4	3	" "	2.17
Chestnut.....	4	3	" "	1.68
Sherwood.....	4	3	" "	1.63
Nuttall.....	4	3	" "	1.42
Wilson.....	4	3	" "	1.69
Meyer.....	4	3	" "	2.24
Haberlandt.....	4	3	" "	1.83
A. K.	4	3	" "	1.94
Swan.....	4	3	" "	2.08
Tashing.....	4	3	" "	1.56
Ebony.....	10	3	" "	1.64
Medium Green.....	6	2	1904-1905	1.32
Black.....	5	2	" "	1.15
Early Yellow.....	3	2	" "	1.18
Ito San.....	3	2	" "	1.43
Early Yellow Dwarf.....	2	2	" "	.74
Ogema.....	2	2	" "	.58

TABLE 6.—AVERAGE YIELDS OF STRAW FROM VARIETIES OF SOYBEANS GROWN AT URRANA
(Tons per acre)

Variety	1905	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	Percentage rating
Medium Green.....	1.20	.52	.75	.68	1.30	.88	.62	.70	.99	1.00	.97	100.0
Ebony.....	...	1.07	.79	1.18	1.52	1.18	.50	.59	1.00	.84	.98	114.7
Haberlandt.....	...	...	...	.78	2.15	1.41	.71	.83	1.33	1.29	.94	132.2
Ito San.....	.65	.97	.79	.75	1.69	1.07	.60	...	...	...	...	109.6
Chestnut.....	...	...	...	...	1.23	.96	.50	.62	1.05	1.12	.82	98.3
Swan.....	...	...	...	...	1.73	1.24	.75	.69	1.14	1.50	1.00	124.6
Meyer.....	...	...	...	...	1.73	1.45	1.28	.79	1.60	1.73	1.27	152.5
Hong Kong.....	...	...	...	...	2.13	1.38	.93	.73	1.60	1.47	1.11	144.7
Wilson.....	...	...	...	...	1.26	.87	.62	.84	1.23	1.01	1.00	105.7
Tashig.....	...	...	...	...	.95	.63	...	.41	.86	1.09	.67	79.8
Nuttall.....	...	...	...	...	1.51	1.36	...	.76	.98	.89	.92	109.9
Sherwood.....	...	...	...	...	1.52	1.68	...	.84	1.28	1.21	.88	126.9
Amherst.....	.63	.95	.74	...	1.42	.95	.75	...	...	...	...	114.5
Ogema.....	.49	.48	.20	.68	.17	.16	...	...	...	...	...	45.9
Black.....	...	.28	.49	.33	...	.33	...	...	...	...	...	50.5
Flat King.....	...	...	...	...	1.47	1.01	.44	.84	...	...	...	107.4
Hollybrook.....	...	...	...	...	1.96	1.55	...	.67	1.04	...	...	134.9
Medium Yellow.....	.55	...	...	...	...	...	.22	...	1.12	.88	...	73.1
A. K.....	...	...	...	...	...	...	...	...	1.14	1.27	.91	112.2
Early Black.....	...	...	...	...	.82	...	.11	...	...	...	...	48.4
Habero.....	...	...	...	...	1.46	.87	...	...	...	...	...	106.8
Pingu.....	...	...	...	...	1.95	1.89	...	...	...	...	...	176.1
Merko.....	...	...	...	...	1.72	1.62	...	...	...	...	...	153.2
U. S. D. A. No. 16786.....	...	...	...	...	1.97	1.38	...	...	...	...	...	153.7
Jet.....	...	...	...	...	1.16	.94	...	...	...	...	...	96.3
Early Yellow.....	.23	...	...	...	...	...	...	...	...	...	...	...
Early Yellow Dwarf.....	.47	...	...	...	...	...	...	...	...	...	...	...
Ito San Northern.....	.69	...	...	...	...	...	...	...	...	...	...	...
Early Yellow Northern.....	.74	...	...	...	...	...	...	...	...	...	...	...
Medium Green Northern.....	1.10	...	...	...	...	...	...	...	...	...	...	...
Acme.....	...	...	...	2.06	...	...	...	...	...	...	...	...
Yellow.....	...	...	...	...	...	1.11	...	...	...	...	...	...

A report on the yield of soybean straw may be of interest to the grower who wishes to raise this crop primarily for seed and to return the straw to the land. Tables 6 and 7 present the results obtained at Urbana from 1905 to 1916. Among the varieties grown for six or more years, Meyer, Hong Kong, Sherwood, Haberlandt, Swan, and Nuttall gave the highest yields of straw.

TABLE 7.—COMPARABLE AVERAGE YIELDS OF STRAW FROM VARIETIES OF SOYBEANS GROWN AT URBANA USING MEDIUM GREEN AS A STANDARD

(Tons per acre)

Varieties	Total number of tests	Number of years compared	Years on which comparison is based	Average yield
Medium Green.....	19	10	1907-1916	.84
Ebony.....	44	10	" "	.96
Medium Green.....	10	8	1909-1916	.89
Haberlandt.....	10	8	" "	1.18
Medium Green.....	14	7	1905, 1907-1912	.85
Ito San.....	8	7	" " "	.93
Medium Green.....	9	7	1910-1916	.92
Chestnut.....	10	7	" "	.91
Swan.....	9	7	" "	1.15
Meyer.....	9	7	" "	1.41
Hong Kong.....	9	7	" "	1.33
Wilson.....	9	7	" "	.98
Medium Green.....	7	6	1910, 1911, 1913-1916	.97
Tashing.....	7	6	" " "	.67
Nuttall.....	7	6	" " " "	1.07
Sherwood.....	7	6	" " " "	1.23
Medium Green.....	14	6	1907-1912	.79
Amberst.....	9	6	" "	.91
Ogema.....	6	6	" "	.36
Medium Green.....	11	4	1907-1909, 1911	.71
Black.....	4	4	" " "	.36
Medium Green.....	5	4	1910-1913	.87
Flat King.....	5	4	" "	.94
Medium Green.....	4	4	1910, 1911, 1913, 1914	.94
Hollybrook.....	4	4	" " " "	1.30
Medium Green.....	9	4	1905, 1912, 1915, 1916	.95
Medium Yellow.....	6	4	" " " "	.69
Medium Green.....	4	3	1914-1916	.99
A. K.	4	3	" "	1.11
Medium Green.....	3	2	1910, 1912	.96
Early Black.....	2	2	" "	.46
Medium Green.....	2	2	1910, 1911	1.09
Habaro.....	2	2	" "	1.16
Pingsu.....	2	2	" "	1.92
Merko.....	2	2	" "	1.67
U. S. D. A. No. 16786...	2	2	" "	1.67
Jet.....	2	2	" "	1.05

VARIETY TRIALS FOR SOUTHERN ILLINOIS
TESTS AT FAIRFIELD, IN WAYNE COUNTY

The variety tests of soybeans at Fairfield have been conducted in a rotation of corn, soybeans, wheat, and clover. Each year since the beginning of the trials in 1905, the varieties have been duplicated in each of two divisions allotted to soybeans. Two systems of farming have been practiced—namely, grain and live-stock; and each variety has been grown in each system of farming in each division. The north divisions of the field are tiled, and the south, untilled. Therefore, each variety has been tested under four conditions each year, and the average yields of the varieties for the season have been made from these four tests.¹ The results are reported in Tables 8 and 9.

Soybeans have preceded wheat in the rotation; the soybeans being harvested, lime applied, and the ground then prepared for winter wheat. This practice makes it necessary to grow only the early-maturing varieties so the crop will mature before it is time to sow the wheat. For this reason the early varieties have been grown longer than the late ones. However, owing to the unfavorable conditions for the growth of clover on the uplands of southern Illinois in 1913, 1914, and 1915, soybeans have been substituted. These have been, for the most part, the late varieties.

TABLE 8.—AVERAGE YIELDS OF VARIETIES OF SOYBEANS GROWN AT FAIRFIELD¹
 (Bushels per acre)

Variety	1905	1906	1908	1909	1910	1911	1913	1914	1915	1916	Percentage rating
Medium Green.	2.3	4.6	4.9	7.2	18.9	13.6	12.0	13.0	9.8	3.1	100.0
Medium Yellow.	2.2	1.3	8.5	10.3	...	9.1	11.8	9.1	15.9	4.6	105.2
Early Black....	3.3	1.5	10.4	10.0	16.8	8.3	...	...	...	...	97.7
Ito San.....	3.8	3.0	8.8	8.2	...	9.1	12.6	...	...	...	102.7
Ebony.....	..	..	..	..	22.1	13.0	13.4	15.8	14.9	17.0	136.8
Sherwood.....	..	..	..	..	...	...	15.1	18.6	16.6	11.4	162.1
Hong Kong....	..	..	..	..	...	...	14.2	15.2	15.7	11.9	150.5
Swan.....	..	..	..	..	...	...	12.0	15.7	17.6	8.1	141.1
Jet.....	..	..	..	..	...	...	10.3	14.8	19.7	10.6	146.3
Wilson.....	..	..	..	..	...	...	10.7	16.2	14.4	10.2	135.8
Amherst.....	..	..	..	..	...	...	11.1	14.9	7.7	8.8	111.6
Flat King.....	..	..	..	..	...	...	...	13.7	12.6	12.0	121.6
Haberlandt....	..	..	..	..	...	...	13.0	17.3	...	...	148.8
Tashing.....	..	..	..	..	...	...	9.7	8.5	...	...	72.8
Meyer.....	..	..	..	..	...	...	...	...	14.6	12.1	206.2
Sable.....	..	..	..	..	...	...	...	...	12.2	9.8	169.2
Mikado.....	..	..	..	..	...	...	...	...	6.4	17.6	184.6
Chestnut.....	..	..	..	..	...	...	...	...	13.2	...	134.7

¹Of the three varieties grown in 1907, Ito San yielded 16.7 bushels of seed, and Early Black, 15.6 bushels. Medium Yellow produced no seed. The 1912 crop was a failure on account of excessive rainfall.

²Beginning in 1914, all soybeans in the live-stock system were cut for hay.

Yield of Varieties on Untreated Land at Fairfield.—In order to determine the yielding qualities of several varieties of soybeans on untreated land, tests were made in 1911 which were fairly representative. In 1912 the crop was a failure on account of an excessive amount of rain, which prevented cultivation. The tests were continued only to a limited extent in 1913. The results appear in Table 10.

Cultivated and Uncultivated Soybeans.—In 1910 tests were started at Fairfield to determine the relative yields of cultivated and uncultivated beans. The cultivated beans were drilled in rows 24 inches apart; the uncultivated in rows 8 inches apart. As nearly as possible the same amount of seed was used in each case. This experiment was repeated in 1911 and also in 1914. A summary of the results appears in Table 11. An average of three years' crops, including 36 tests each year, shows 1.1 bushels difference in favor of the uncultivated

TABLE 9.—COMPARABLE AVERAGE YIELDS OF VARIETIES OF SOYBEANS GROWN AT FAIRFIELD USING MEDIUM GREEN AS A STANDARD
(Bushels per acre)

Variety	Total number of tests	Number of years compared	Years on which comparison is based	Average yield
Medium Green....	34	9	1905-1916, except 1907, 1910, 1912	7.7
Medium Yellow....	30	9	" " " " " " "	8.1
Medium Green....	28	6	1905-1911, except 1907	8.6
Early Black.....	24	6	" " " " "	8.4
Medium Green....	28	6	1905-1913, except 1907, 1910, 1912	7.4
Ito San.....	24	6	" " " " " " "	7.6
Medium Green....	18	6	1910-1916, except 1912	11.7
Ebony.....	36	6	" " " " "	16.0
Medium Green....	10	4	1913-1916	9.5
Sherwood.....	10	4	" "	15.4
Hong Kong.....	10	4	" "	14.3
Swan.....	10	4	" "	13.4
Jet.....	10	4	" "	13.9
Wilson.....	10	4	" "	12.0
Amherst.....	10	4	" "	10.6
Medium Green....	6	3	1914-1916	8.6
Flat King.....	6	3	" "	12.8
Medium Green....	6	2	1913-1914	12.5
Haberlandt.....	6	2	" "	15.2
Tashing.....	6	2	" "	9.1
Medium Green....	4	2	1915-1916	6.5
Meyer.....	4	2	" "	13.4
Sable.....	4	2	" "	11.0
Mikado.....	4	2	" "	12.0
Medium Green....	2	1	1915	9.8
Chestnut.....	2	1	"	13.2

beans in spite of the fact that a considerable growth of weeds and grass may occur where beans are uncultivated.

In 1914 and 1915 beans were planted principally in 24-inch and 32-inch rows. The acre-yields are shown in Table 12.

Yields of Varieties of Soybeans Grown for Hay.—Beginning in 1914 all varieties of soybeans in the live-stock system of farming were harvested for hay. They were grown in rows 32 inches apart and were well cultivated. The yields each year have been computed by averaging the results from the tilled and the untilled portions of the field. They are expressed in tons per acre of thoroly air-dry hay (Table 13).

Best Variety of Soybeans for Southern Illinois.—Just which is the best variety of soybeans for southern Illinois depends upon the use for which the crop is intended. For the largest tonnage of hay and the largest yield of beans per acre, the late beans are best. Varieties

TABLE 10.—AVERAGE YIELDS OF VARIETIES OF SOYBEANS GROWN ON
UNTREATED LAND AT FAIRFIELD
(Bushels per acre)

Variety	1911	1913
Medium Green.....	10.1	8.6
Sherwood.....	8.3	9.8
Ebony.....	7.7	8.6
Medium Yellow.....	4.4	8.7
Ito San.....	3.8	8.2
Haberlandt.....	8.9	..
Amherst.....	8.7	..
U. S. D. A. No. 16786.....	7.9	..
U. S. D. A. No. 9408.....	7.8	..
Merko.....	7.7	..
Meyer.....	7.6	..
Hong Kong.....	7.4	..
Hollybrook.....	7.1	..
Swan.....	..	7.1
Wilson.....	6.9	..
Pingsu.....	5.5	..
Jet.....	5.4	..
Flat King.....	5.0	..
Tashing.....	4.1	..
Chestnut.....	2.9	..
Early Black.....	2.7	..
Ogema.....	1.1	..

TABLE 11.—AVERAGE YIELDS OF CULTIVATED AND UNCULTIVATED SOYBEANS
GROWN AT FAIRFIELD
(Bushels per acre)

	1910	1911	1914	3-year average
Cultivated: 24-inch rows.....	17.7	11.6	14.0	14.4
Uncultivated: 8-inch rows.....	20.8	11.6	14.0	15.5

TABLE 12.—AVERAGE YIELDS OF BEANS AND HAY GROWN AT FAIRFIELD
(Bushels and tons per acre)

Row space	1914		1915	
	Beans	Hay	Beans	Hay
24 inches.....	14.0	1.29	16.4	1.86
32 inches.....	13.3	1.11	15.9	1.90
40 inches.....	...	...	12.2	1.55

TABLE 13.—AVERAGE YIELDS OF HAY FROM VARIETIES OF SOYBEANS
GROWN AT FAIRFIELD (Tons per acre)

Variety	1914	1915
Sherwood.....	1.97	2.08
Ebony.....	1.58	1.93
Jet.....	1.40	2.06
Swan.....	1.39	2.06
Wilson.....	1.43	1.96
Hong Kong.....	1.33	2.05
Flat King.....	1.54	1.75
Amherst.....	1.55	1.34
Medium Yellow.....	.99	1.89
Medium Green.....	1.63	1.10
Sable.....	...	2.16
Meyer.....	...	2.03
Chestnut.....	...	1.71
Haberlandt.....	1.52	...
Mikado.....	...	1.38
Tashing.....	.73	...

such as Sherwood and Ebony give good yields both of hay and of beans. Where winter wheat is to follow soybeans after the removal of the soybeans in the fall, the early varieties, such as Medium Yellow and Medium Green are preferable, as they can be removed before it is necessary to prepare the ground for wheat.

Medium Yellow is preferred to Medium Green because it yields more and does not crack badly in threshing, as does Medium Green. Medium Green shatters badly in ripening. Ebony is a later variety. It produces good crops of fine quality seed and hay. The stems are fine, the leaves do not shatter much, and the beans do not crack badly in threshing.

COWPEAS

Cowpeas should be planted after the best date for planting corn. They usually vine too much to permit harvesting with a binder; otherwise, methods of seeding, cultivation, harvesting, and threshing are the same for cowpeas as for soybeans. Cowpeas are cross-inoculated with bacteria from many other common legume crops; but unless the soil is known to contain the proper bacteria, it is advisable to obtain soil from a field on which well-inoculated cowpeas were previously grown, and proceed according to the method outlined for soybean inoculation.

[April,

TABLE 14.—CHARACTERISTICS OF VARIETIES OF SOYBEANS

Variety	Shape and size of plants	Size of pod	Shape of seed	Color of seed	Maturity of plant in days	General remarks
Acme.....	Tall, slender, erect, with twining tips	Medium	Elliptical, slightly flattened, medium-sized	Yellow; hilum brown; germ yellow	130 to 145	Good variety for hay
A. K.....	Erect, with medium stems and foliage	Medium	Elliptical, slightly flattened, medium-sized	Straw-yellow with occasional brown markings; germ yellow	110 to 120	Yields well
Amherst.....	Medium height, stout, erect, bushy; stems woody.	Medium	Elliptical, slightly flattened, medium-sized	Light yellow; germ yellow	110 to 120	Yields fairly well
Baird.....	Stout, erect, bushy, medium tall	Small	Small, almost round	Brown; germ yellow	120 to 130	Good variety for hay
Chestnut.....	Stout, erect, medium height	Medium	Medium-sized, elliptical, flattened	Olive-yellow with occasional light brown spots; germ yellow	90 to 100	Yields good crops of beans and hay
Early Black...	Erect, stout, rather low	Medium large	Elliptical, only slightly flattened, roundish	Black; germ yellow	100 to 110	Yields well for early variety. Not desirable for hay
Ebony.....	Stout, erect, bushy; stems fine; retains leaves well	Medium	Elliptical, not much flattened	Black; germ yellow	120 to 130	Very popular in Illinois. Yields well. Known as U. S. D. A. No. 9414; also as Black Beauty
Flat King.....	Stout, erect, medium height	Large, flattened	Large, elliptical, much flattened	Black; germ yellow	About 125	Produces moderate crops of beans and hay
Habaro.....	Erect, bushy, short	Medium	Medium-sized, elliptical, slightly flattened	Straw-yellow; germ yellow	90 to 100	Not suitable for hay
Hollybrook....	Stout, erect, bushy, medium height	Medium	Rather small, elliptical, slightly flattened	Yellow; germ yellow	120 to 130	Produces moderate crops of beans and hay

TABLE 14.—Continued

Variety	Shape and size of plants	Size of pod	Shape of seed	Color of seed	Maturity of plant in days	General remarks
Hong Kong.....	Stout, erect, bushy	Medium	Elliptical, slightly flattened	Straw-yellow; germ yellow	110 to 120	Stems too coarse for best quality hay. Another bean called Hong Kong, and known as U. S. D. A. No. 22407, has medium-sized black seeds oblong, with green germ
Hope.....	Stout, erect, medium height	Rather large	Elliptical, slightly flattened	Olive-yellow; germ yellow	130 to 145	Too late in maturity for seed
Ko San.....	Stout, erect, bushy, not so tall as Medium Yellow	Medium	Elliptical	Straw-yellow; hilum pale; germ yellow; black speck at end of seed scar	About 100	Too small for hay
Jet.....	Slender, with twining tips, tall	Rather small	Small elliptical, much flattened	Black; germ yellow	110 to 120	Produces good crops of beans and hay. Retains leaves well. Seeds are not easily cracked. Very desirable medium-maturing variety
Medium Green.	Stout, erect, bushy; stems coarse	Medium	Medium-sized to large, roundish	Green; germ green	100 to 110	Seed splits badly in threshing. Also shatters badly after being wet in field; leaves drop readily
Medium Yellow	Bushy, erect, stout, medium height	Medium	Nearly round, medium to large	Straw-yellow; hilum pale; germ yellow	100 to 110	Most widely grown early bean in Illinois. Adapted to precede winter wheat in rotation
Morko.....	Slender, erect, with twining tips; medium height	Small	Small, long, flattened	Brown; germ yellow	100 to 110	Fair variety for hay

TABLE 14.—*Concluded*

Variety	Shape and size of plants	Size of pod	Shape of seed	Color of seed	Maturity of plant in days	General remarks
Meyer.....	Slender, erect, with twining tips	Rather large	Large, elliptical much flattened	Variable from light olive-green to brown and black. Colors in concentric bands or mottled. Germ yellow; hilum brown	110 to 120	Produces good crops of beans and hay
Mikado.....	Erect, stout, rather tall		Medium-sized, almost round	Olive-yellow	About 120	Produces good crops of beans
Nuttall.....	Erect, bushy, medium height	Rather large	Medium-sized, elliptical, slightly flattened	Black; germ yellow	100 to 110	Beans split easily
Ogema.....	Erect, bushy, short	Medium	Elliptical, flattened	Brown; germ yellow	90 to 100	Not suitable for hay
Pingsu.....	Erect, slender, tall with twining tips	Rather small	Small, long, flat	Black; germ yellow	120 to 130	Good variety for hay. Seed shatters some
Sable.....	Erect, bushy, tall with slender stems	Medium	Elliptical, much flattened	Black; germ yellow	110 to 120	Hard to distinguish from Jet. Good variety for hay and beans
Sherwood.....	Tall, erect, with twining tips. Main stem rather coarse	Medium	Medium-sized, elliptical, slightly flattened	Straw-yellow; germ yellow; hilum usually brown	110 to 120	Produces good crops of beans and hay
Swan.....	Stout, erect, bushy	Medium	Medium-sized, elliptical, slightly flattened	Straw-yellow; hilum brown; germ yellow	About 110	
Tashing.....	Bushy, erect, short	Medium	Medium-sized, elliptical, slightly flattened	Dark green; germ green; hilum black	90 to 100	Produces moderate crops of both hay and beans. Seeds shatter much
Wilson.....	Slender, tall with twining tips	Medium large	Medium large, elliptical, flattened	Black; germ yellow	110 to 120	Beans easily split in threshing. Seed coat rather loose on cotyledon. Fair producer of beans and hay

VARIETY TRIALS FOR CENTRAL ILLINOIS
TESTS AT URBANA, IN CHAMPAIGN COUNTY

Cowpea variety trials were first conducted at Urbana in 1901 on the University North Farm. In 1903 these trials were systematically started on the South Farm. Seeding and methods of management have been carried on in the same manner as described for soybeans. Data regarding varieties of cowpeas were obtained largely from a rotation of corn, corn, corn, and legumes (soybeans or cowpeas). The system of farming which was followed would correspond more nearly to what is now known as the live-stock system, since manure was returned to the land instead of crop residues.

Cowpeas have given rather unsatisfactory results at Urbana. For seed production, soybeans are so superior that the Station has con-

TABLE 15.—AVERAGE YIELDS OF SEED FROM VARIETIES OF COWPEAS GROWN
AT URBANA (Bushels per acre)

Variety	1901	1904	1905	1906	1907	1908	1909
Whippoorwill.....	.3	.0	2.3	3.7	.0	.0	.0
Extra Early Black Eye.....	.9	4.5	7.8	3.0	7.3	6.0	9.4
New Era.....	..	3.5	6.7	6.6	3.3	.7	1.2
Michigan Favorite.....	..	.9	9.4	1.7	.0	.7	1.3
Wonderful.....	.9	.0	.4	..	..	..	.0
Black.....	.0	.0	..	..	..	.5	.0
Warren's Extra Early.....	..	2.1	3.4	1.5	.0	..	..
Taylor.....	.0	.0	..	..	..	..	..
Clay.....	.0	.0	..	..	..	..	..
Old Man.....	..	..	..	1.0	..	.5	..
Large Black Eye.....	.8	..	..	..	..	..	..
Red Ripper.....	..	.0	..	..	..	..	..
Rice.....	..	.0	..	..	..	..	..
Iron.....	..	.0	..	..	..	..	..
Gallivant.....	..	.0	..	..	..	..	..
Buckbee's Early Prolific.....	..	..	.7	..	..	..	..

TABLE 16.—AVERAGE YIELDS OF HAY FROM VARIETIES OF COWPEAS GROWN
AT URBANA (Tons per acre)

Variety	1901	1904
Whippoorwill.....	1.66	.91
Extra Early Black Eye.....	2.03	.70
New Era.....	..	1.30
Michigan Favorite.....	..	1.14
Wonderful.....	2.46	.81
Black.....	2.02	1.40
Warren's Extra Early.....	..	.82
Taylor.....	2.25	.75
Clay.....	1.80	1.30
Large Black Eye.....	1.46	..
Red Ripper.....	..	.80
Rice.....	..	.97
Iron.....	..	.91
Gallivant.....	..	.73

ducted few field trials with cowpeas. Tables 15, 16, and 17 give the yields of cowpea seed, hay, and straw for the Urbana field.

TABLE 17.—AVERAGE YIELDS OF STRAW FROM VARIETIES OF COWPEAS GROWN AT URBANA
(Tons per acre)

Variety	1905	1906	1907	1908	1909
Whippoorwill.....	1.58	1.24	.35	.69	.00
Extra Early Black Eye.....	1.00	...	1.08	.58	.68
New Era.....	1.60	...	1.15	.75	.82
Michigan Favorite.....	1.17	1.18	.42	.93	.78
Wonderful.....	1.54	...	...	...	.90
Black.....	...	...	...	.61	.96
Warren's Extra Early.....	1.12	.44	.62	...	...
Old Man.....	...	1.45	...	.35	...
Buckbee's Early Prolific.....	1.54	...	...	...	...

VARIETY TRIALS FOR SOUTHERN ILLINOIS TESTS AT FAIRFIELD, IN WAYNE COUNTY

Cowpeas are grown in southern Illinois to a greater extent than soybeans, both for seed and for hay. In some localities they do not seem to yield so well as soybeans; in other localities they yield better. At Fairfield they were dropped from the rotation because of their failure to mature before it was necessary to prepare the ground for wheat, and because they produced less seed per acre than soybeans. In some years they have yielded nearly as much as soybeans, but generally they have produced considerably smaller crops. The results of the tests with cowpeas at Fairfield appear in Table 18.

TABLE 18.—AVERAGE YIELDS OF VARIETIES OF COWPEAS GROWN AT FAIRFIELD
(Bushels per acre)

Variety	1905	1906	1907	1908	1909	1910	1911	1912	Average
Black.....	2.2	.0	2.8	12.1	1.1	12.9	..	..	5.2
Michigan Favorite.....	..	..	5.5	9.4	5.9	15.3	.0	..	7.2
Whippoorwill.....	2.1	.0	..	..	3.5	14.9	.0	.0	3.4
New Era.....	3.0	4.1	3.1	..	3.7	...	..	..	3.5

By inspecting the yields of soybeans given in Table 9, it will be seen that the range of average yields is from 6.5 to 16.0 bushels per acre, while the range of average yields of cowpeas, as shown in Table 18, is only from 3.4 to 7.2 bushels per acre.

Not only the low yield of the cowpea, but its frequent failure to mature, makes it less desirable than the soybean. It must be borne in mind that on poor, unfertilized, sour soils, where the soybean cannot make its best growth, the cowpea may be the better crop; but where rational soil improvement is practiced, the comparable data thus far secured are markedly in favor of the soybean.

